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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/760,051	ARSENAULT ET AL.	
	Examiner	Art Unit	
	Max Shikhman	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 August 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-35,45-49 and 51-57* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35,45-49 and 51-57* is/are rejected.

7)☒ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Response to Amendment

1. Applicants' response to the last Office Action, filed 08/06/2007 has been entered and made of record.

Claim Objections

2. Claims 1-35, 45-49,51,52 objected to because of the following informalities: In claim 45, amended part, change "*means for means for*" to --means for--. Appropriate correction is required.

In Claims 1 and 20, change "enhanced images" to --enhanced image--.

In Claims 1 and 20, last line, change "within the image" to --within the result image--, if this makes sense to attorney.

In Claims 1 and 20, last 3 lines, "*said enhanced images of blood vessels are shown within the image*" is impossible because unenhanced image has been added to inverted smoothed image. Maybe say, blood vessels are enhanced in the resultant image.

Claim 56 recites the limitation "*said computer unit*". There is insufficient antecedent basis for this limitation in the claim. Claim 53 only recites "computing unit".

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 4-6, 23, 57 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claims 4,23 need to specify the units on number 51. Maybe pixels.

6. Claim 57 recites the limitation "said headset". There is insufficient antecedent basis for this limitation in the claim. Claims 53,57 do not mention a headset.

Claim Rejections - 35 USC § 101

7. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

8. Claims 20-35 rejected under 35 U.S.C. 101 because in these claims a functional descriptive material, which is a computer program product, is not residing on a computer readable medium.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1-35 rejected under 35 U.S.C. 103(a) as being unpatentable over Gonzalez, "Digital Image Processing, 2/E", Prentice Hall, 2002, p111, p132, in view of Darbee, US-PAT-NO: 7043074.

() **Regarding Claims 1,20**:

For claim 20: *A computer program product* (p29 Fig1.24 "Image processing software".)

Regarding claim 1, Gonzalez discloses:

a process for enhancing blood vessel images within images of a region under Skin Of a part of a living body (Figure 3.29(b)).

The embodiment of Gonzalez depicted in figure 3.29 does not disclose the specific enhancement steps of claim 1, including:

A. saving unenhanced image data representing the image of the region under the skin of the part of the living body;

B. copying said unenhanced image data to create a copy of said unenhanced image data;

C. transforming said copy of said unenhanced image data to produce transformed image data;

D. smoothing a substantial portion of said transformed image data to produce smoothed image data;

E. retransforming said smoothed image data;

F. inverting said retransformed smoothed image data to generate inverted image data, wherein said inverted image data comprises enhanced images of blood vessels; and

G. adding at least a portion of said inverted image data to at least a portion of said saved unenhanced image data to generate a result image in which said enhanced images of blood vessels are shown within the image of the region under skin of the part of the living body.

Regarding differences A, B and D, Gonzalez also teaches a technique for enhancing images (i.e., "unsharp masking" at page 132), applicable to any image, which includes:

A. *saving unenhanced image data representing the image* ("f(x,y)" at equation 3.7-7; the image data is necessarily saved in that 1) Gonzalez discloses an algorithm performed using a computer and computer data to be processed is necessarily "saved", and 2) if it weren't, Gonzalez would not be able to perform his filtering);

B. *copying said unenhanced image data to create a copy of said unenhanced image data* (" $\bar{f}$ (x,y)" is a "blurred version of f(x,y)" as described at page 132, and in order to create a blurred version of an original, one must make a copy of the original)

D. *smoothing a substantial portion of said image data to produce smoothed image data* (" $\bar{f}$ (x,y)" is a "blurred version of f(x,y)" as described at page 132; again refer to equation 3.7-7); and

Subtracting the smoothed image data from the original image data to generate a result image in which is an enhanced version of the original ("$f_s(x,y)$" is a sharpened and thus enhanced image; refer to equation 3.7-7).

Regarding differences C and E, the Gonzalez "unsharp mask" embodiment discussed above requires filtering an original image to produce a blurred image. Gonzales does not describe whether the filtering to produce the blurred image is performed in the spatial or frequency domain. However, Gonzales further teaches the merits of filtering an image in the frequency domain, as depicted in figure 4.5, comprising:

C. *transforming a copy of an original image to produce transformed image data* ("Fourier Transform" producing "F(u,v)" at figure 4.5);

D. *smoothing the image* ("Filter Function" at figure 4.5); and

E. *retransforming said smoothed image data* ("Inverse Fourier Transform" at figure 4.5).

Regarding differences F and G, While the Gonzalez "unsharp mask" embodiment discussed above requires subtracting a filtered version of an original image from the original to produce an enhanced image, Gonzales does not describe the claimed steps of inverting the filtered image and adding it back to the original.

Darbee also discloses implementation of an unsharp mask ("blurring and subtracting" at column 7, line 37). However, Darbee teaches, "subtraction is not a commonly available image-processing option" and as a remedy, Darbee teaches the technique of:

F. *inverting the smoothed image data to generate inverted image data* ("negative (inverted) image" at column 7, line 39; and

G. *adding at least a portion of said inverted image data to at least a portion of said original image* ("is instead added" at column 7, line 41).

Darbee explains that his technique is "simple" and "easily accomplished" at column 7, line 41.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to enhance blood vessel images as taught by Gonzalez (e.g., figure 3.29), using the unsharp masking technique also taught by Gonzalez (e.g., equation 3.7-7), wherein the filtering of equation 3.7-7 is performed in the frequency domain as taught by Gonzalez (e.g., figure 4.5), and the subtraction of 3.7-7 is performed using the inversion and addition technique as taught by Darbee. The Gonzales blood vessel enhancement could be modified by adding the unsharp mask, with filtering in the frequency domain, and subtracting using inverstion/addition according to well-known electrical engineering and computer programming techniques without undue experimentation. In the combination, the unsharp mask, frequency domain filtering and inversion/addition would perform the exact same functions as it did separately (i.e., the

unsharp masking would serve to enhance the high frequencies of the blood vessel images, the frequency domain filtering serving to produce a filtered images, and the inversion/addition serving as an image subtraction technique). The result of the Gonzalez and Darbee combination would be completely predictable in that the blood vessel image of Gonzalez would be enhanced via the effects of the unsharp mask. Furthermore, one skilled in the art would be motivated to utilize an unsharp mask because it is a computationally simple image processing technique for enhancing an image and thus brining out its detail. The obviousness rationale advanced hereinabove is consistent with the criteria articulated in KSR International Co. v. Teleflex Inc., 82 USPQ2d 1385 (U.S. 2007).

() **Regarding Claims 2,21**:

The process of claim 1 wherein said smoothing step comprises the step of blurring (P132, 6 lines from the bottom, "blurred") *said transformed image data to produce smoothed image data.* [$\bar{f}(x,y)$]

() **Regarding Claims 3,22**:

The process of claim 2 wherein said blurring step comprises Gaussian blurring (P177) *said transformed image data,*

wherein said Gaussian blurring step comprises initializing a kernel and wherein said initializing step comprises the steps of:

generating an effectively-dimensioned kernel array;

(P204 2nd paragraph, "freq domain filter function to be inverse transformed".
P203 (4.6-26) h(x,y))

padding said effectively-dimensioned kernel array to produce an effectively dimensioned padded kernel array; (P203 4.6-26. $h_e(x,y)$. P204 2nd paragraph, "padded")

and transforming said effectively padded kernel array.

(P204 2nd paragraph, "and then forward transformed")

() **Regarding Claims 4,23**:

The process of claim 3 wherein said step of generating an effectively dimensioned kernel comprises the step of generating a kernel having a base radius of approximately 51.

(Fig 4.17c. Do=40, which is approximately 51. Do is the base radius.)

() **Regarding Claims 5,24**:

The computer program product of claim 22 wherein said effectively-dimensioned padded kernel array is padded (formula 4.6-26) *to a size with a height having a power of two and a width having a power of two.*

(P57, "due to hardware considerations...power of 2"

Power of 2 is necessary for FFT.

P213 bottom, for efficient implementation of FFT transform, we would like "a power of 2" in each dimension. We need FFT to frequency-convolve. P213 $M=2^n$, so M is a power of 2. Since x and y are independent, they would both be a power of 2.)

() **Regarding Claim 6,25**:

The process of claim 5 wherein said step of padding said effectively-dimensioned kernel array to produce an effectively-dimensioned padded kernel array comprises the step of padding said effectively-dimensioned kernel array to produce a kernel padded with a black border to a size of 1024 by 512 pixels.

(P208 M=1024. It would be obvious to try different sizes for y direction, to see which one gives the best result.)

() **Regarding Claims 7,26**:

The process of claim 2 wherein said blurring step further comprises the step of frequency-convolving said transformed image data (P159 Fig4.5 H(u,v)F(u,v))

to produce smoothed image data.

(H(u,v) can take the function of Fig4.7 low pass filter.

Fig4.38c.)

() **Regarding Claims 8,27:**

The process of claim 1 further comprising the step of padding said copy of said unenhanced image data to produce padded image data, (P203 Formula 4.6-25)

wherein said transforming step (P159 Fig4.5 "Fourier transform") *comprises transforming said padded image data to produce transformed image data.* (Fig4.38c "properly padded input images")

() **Regarding Claims 9,28**:

The process of claim 1 further comprising the step of contrast stretching

(Gonzalez. P85 Fig3.10, "Contrast stretching")

said result image to include a substantially full range of pixel values to generate a stretched image. (P85 "increase dynamic range")

() **Regarding Claims 10,11,29,30**:

The process of claim 1 further comprising the step of applying an effective gamma curve to said result image to generate a gamma corrected image.

(Gonzalez. Page 81. Gamma correction can be applied to any image.)

() **Regarding Claims 12:**

The process of claim 11 further comprising the step of padding said copy of said unenhanced image data to produce padded image data, [P203 (4.6-25) $f_e(x,y)$]

wherein said transforming step comprises transforming said padded image data to produce transformed image data. (frequency domain)

(Page 204 1st paragraph, "By properly padding the input image and the filter function as shown in Fig4.38b..."

Page 203 Fig4.38c "filtering in the frequency domain with properly padded input images.")

() **Regarding Claims 13:**

The process of claim 1 wherein said unenhanced image data is analog image data (P54 Fig 2.17a "continuous image")

and wherein said process further comprises the step of converting said analog unenhanced image data to an effectively-dimensioned digital image array.

(P54 Fig 2.17 and section 2.4.2, "matrix")

() **Regarding Claims 14:**

14. (Original) *The process of claim 13 wherein said step of converting said analog unenhanced image data to an effectively-dimensioned digital image array comprises the step of converting* (Fig2.16 "quantization") *said analog image to an 8-bit* (P57 "most common number is 8 bits") *grayscale image array.* (P57 "gray level")

() **Regarding Claims 15,31:**

The process of claim 1 wherein said smoothing step comprises blurring a substantial portion of said transformed image data and

(Figs 4.15bcd, 4.18bcd show blurring a substantial portion)

wherein said blurring comprises the step of generating a blur kernel (P175 4.3-7 and P176 4.3-8) *from a standard deviation* (P176 top, "$\sigma = D_0$".) *determined to be effective* (P174,P177, Figs 4.15bcd, 4.18bcd try different radii to see which one is effective.)

for enhancing blood vessels. (Figs 4.15bcd, 4.18bcd. This smoothing technique will work on blood vessels also. The rods in the figures can represent thin blood vessels.)

() **Regarding Claims 16,32:**

The process of claim 15 wherein said blurring step comprises Gaussian blurring a substantial portion (Fig 4.18bcd show Gaussian blurring a substantial portion) *of said transformed image data* (P176 (4.3-8). P177 "cutoff frequencies")

and wherein said Gaussian blurring comprises the step of generating a Gaussian blur kernel from a standard deviation in the range of between about 10 pixels and 23

pixels. (P174, P177, Figs 4.15bcd, 4.18bcd try different radii to see which one is effective. Radii of 15 included there.)

() **Regarding Claim 17,33:**

The process of claim 1 further comprising the steps of repeating said saving, transforming, smoothing, retransforming, inverting, and adding steps (described in claim 1)

at a rate (P510 "bit rate") *sufficient to produce a sequence of result images* (video) *in substantially real time.* (P510 section 8.6.3. "direct visual feedback")

() **Regarding Claim 18,34:**

The process of claim 17 wherein said repeating step comprises repeating said saving, transforming, smoothing, retransforming, inverting, and adding steps at a rate of at least five times per second. (P510 section 8.6.3. "delays exceeding 150ms do not provide viewers with ... ")

() **Regarding Claim 19,35:**

The process of claim 1 further comprising the step of selecting a ratio of said inverted image data to be added to said saved unenhanced image data to generate said result image, wherein said selecting step is performed prior to performing said adding step.

(Gonzalez. An image can be multiplied by a number, like A in formula 3.7-8. So, in 3.7-7 multiply $\bar{f}(x,y)$ by a desired number to select a ratio.)

11. Claims 45,46,49,51,52 rejected under 35 U.S.C. 103(a) as being unpatentable over Flock US-PAT-NO: 6032070 in view of Gonzalez, "Digital Image Processing, 2/E", Prentice Hall, 2002, p111, p132, in view of Darbee US-PAT-NO: 7043074.

Claims 1 and 53 contain all limitations of Claim 45. Motivation is provided below.

() **Regarding Claim 45**:

45. *A system for capturing images of a region under skin of a part of a living body, enhancing blood vessel images within captured images, and displaying enhanced result images in substantially real time, said system comprising:*

an infrared emitter configured to illuminate the region under the skin with waves of infrared light;

an infrared detector configured to accept waves of infrared light reflected from the region under the skin, said infrared detector comprising an output for outputting a signal corresponding to unenhanced image data;

a computing unit comprising an input for accepting said unenhanced image data, a memory, means for enhancing and outputting result images in which enhanced images of blood vessels are shown within the images of the region under the skin of the part of the living body,

and an output for outputting said enhanced images; and

a display device for inputting said enhanced images from output of said computing unit and displaying said enhanced images in substantially real time;

All of the above limitations of Claim 45 are addressed in Claim 53.

These limitations of Claim 45 are addressed in Claim 1:

wherein said means for enhancing and outputting result images comprises computer program means stored within said memory, said computer program means comprising;

a digital transformer means for transforming image data to produce transformed image data;

a smoothing operator for smoothing a substantial portion of said transformed image data to produce smoothed image data;

a digital retransforming means for retransforming said smoothed image data

a digital inverter for inverting said smoothed image data to generate inverted image data; and

an adding function for adding said inverted smoothed image data to unenhanced image data to generate a result image.

As Gonzalez discloses, it is desirable to enhance or sharpen the image with unsharp masking. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use unsharp masking of Gonzalez to enhance or sharpen Flock's images.

() **Regarding Claim 46**:

All limitations of claim 49 are covered in claim 54.

() **Regarding Claim 49**:

All limitations of claim 49 are covered in claim 48.

() **Regarding Claim 51**:

All the limitations of claim 51 are covered in claim 56.

() **Regarding Claim 52**:

All the limitations of claim 52 are covered in claim 57.

12. Claims 47,48 rejected under 35 U.S.C. 103(a) as being unpatentable over Flock US-PAT-NO: 6032070 in view of Gonzalez, "Digital Image Processing, 2/E", Prentice Hall, 2002, p111, p132, and Darbee US-PAT-NO: 7043074 as described above and further in view of Holman PGPUB-DOCUMENT-NUMBER: 20040080938

() **Regarding Claim 47**:

The system of claim 45 wherein said infrared emitter comprises two arrays of surface mounted light emitting diodes comprising integral micro reflectors.

Flock discloses everything as described above except, "*two arrays of surface mounted light emitting diodes comprising integral micro reflectors.*"

***

Holman discloses, *two arrays* (arrays) *of surface mounted* ([0089] [0091]) *light emitting diodes* ([0083]) *comprising integral micro reflectors.* [0033]

([0033] "arrays of discretely tapered micro reflectors."

[0083] "Preferable two-dimensional emitting arrays are spatial arrangements of discrete emitting regions, including planar arrays of pre-packaged LEDs or bare LED chips.

These discrete arrays may be a single line of equally spaced elements or a series of equally spaced lines of equally spaced elements."

[0089] "LEDs are presently manufactured in ... 1.5-3.0 mm square ceramic surface mounts suitable for conventional printed circuit boards.)

Holman's invention [0001] is thin and compact with well-organized output illumination. Micro reflectors can be focus LED light on a specific area to provide focused magnified light [0056]. LEDs are presently manufactured in ... 1.5-3.0 mm square ceramic surface mounts suitable for conventional printed circuit boards. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use Holman's invention in Flock. This would make Flocks' apparatus smaller and lighter.

() **Regarding Claim 48**:

All the limitations of claim 48 are covered in claim 55.

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13. Claims 53-57 rejected under 35 U.S.C. 103(a) as being unpatentable over Flock (US-PAT-NO: 6032070) in view of Holman PGPUB-DOCUMENT-NUMBER: 20040080938.

() **Regarding Claims 53**:

Flock discloses a *system for capturing images of a region under skin of a part of a living body,*

(Column 3, lines 15-20, DESCRIPTION OF THE INVENTION, "system for locating an anatomical structure, such as a blood vessel, wherein the system comprises a light source and an image detector, which detects light radiation reflected from the area of examination, and a monitor which receives and displays image information from said image detector.")

enhancing blood vessel images within captured images, and

(Column 3, lines 30-35, "present invention may include elements that enhance the contrast between the anatomical structure and the surrounding tissue in the image. The term "contrast enhancing element" refers to any element or combination of elements which enhance contrast between the anatomical structure and its surrounding tissue in the image.")

displaying enhanced result images in substantially real time,

(Column 3, lines 15-20, DESCRIPTION OF THE INVENTION, "a monitor which receives and displays image information from said image detector."
Column 3, lines 53-55, "single integral unit also provides for the creation of a helmet capable of producing a real-time three-dimensional image of an area inside a patient in a manner that directly corresponds to the helmet wearer's line of vision.")

said system comprising: an infrared emitter (20) *configured to illuminate the region under the skin* (Fig 2: 8. Col6 line 67) *with waves of infrared fight;*

(Col 4 line 31, "700-900 nm". Col7 line 3.

Column 3, lines 15-20, "system for locating an anatomical structure, such as a blood vessel, wherein the system comprises a light source and an image detector, which detects light radiation reflected from the area of examination.

Claim 61, "a source within the infrared range;")

an infrared detector (12) *configured to accept waves of infrared light reflected from the region under the skin,* (8)

(Column 3, lines 23-27, "image detector refers to any device capable of detecting light, including but not limited to charge-coupled device infrared cameras.")

said infrared detector comprising an output for outputting a signal corresponding to unenhanced image data; (Fig2: 12 to 24)

(Column 3, lines 15-20, "a monitor which receives and displays image information from said image detector.")

a computing unit (24. Col7 line 13 "processor") *comprising an input for accepting said unenhanced image data,*

a memory,

(Column 5, line 5, "stored.")

means for enhancing and outputting result images in which enhanced images of blood vessels are shown within the images of the region under the skin of the part of the living body,

(Column 3, lines 30-35, "enhance the contrast between the anatomical structure and the surrounding tissue in the image.

Column 5, line 5, "The two images are sequentially captured with a digitizing frame grabber, stored and subtracted from one another. The resultant image lacks the effects of scatter present in each image since scattered light is subtracted out."

and an output for outputting said enhanced images; and a

(Column 3, lines 15-20, DESCRIPTION OF THE INVENTION, "a monitor which receives and displays image information from said image detector."

Column 3, lines 53-55, "single integral unit also provides for the creation of a helmet capable of producing a real-time three-dimensional image of an area inside a patient in a manner that directly corresponds to the helmet wearer's line of vision."

Column 3,line 59, "helmet may contain a monitor, such as a monitor within an eye piece, which displays the contrasted image of the anatomical structure."

Col 4, lines 3-5, "embodiment allows the wearer to see the contrasted structure within a patient")

display device (14) *for inputting said enhanced images from output of said computing unit* (24) *and displaying said enhanced images in substantially real time.* (real-time)

(Column 4, lines 45-55, "...light source and the reflected image detector to be part of a single integral unit... the possibility of a single integral unit also provides for the creation of a helmet capable of producing a real-time three-dimensional image of an area inside a patient.")

Flock discloses everything as described above except, "*two arrays of surface mounted light emitting diodes comprising integral micro reflectors.*"

***

Holman discloses, *two arrays* (arrays) *of surface mounted* ([0089] [0091]) *light emitting diodes* ([0083]) *comprising integral micro reflectors.* [0033]

([0033] "arrays of discretely tapered micro reflectors."

[0083] "Preferable two-dimensional emitting arrays are spatial arrangements of discrete emitting regions, including planar arrays of pre-packaged LEDs or bare LED chips. These discrete arrays may be a single line of equally spaced elements or a series of equally spaced lines of equally spaced elements."

[0089] "LEDs are presently manufactured in ... 1.5-3.0 mm square ceramic surface mounts suitable for conventional printed circuit boards.)

Holman's invention [0001] is thin and compact with well-organized output illumination. Micro reflectors can be focus LED light on a specific area to provide focused magnified light [0056]. LEDs are presently manufactured in ... 1.5-3.0 mm square ceramic surface mounts suitable for conventional printed circuit boards. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use Holman's invention in Flock. This would make Flocks' apparatus smaller and lighter.

() Regarding Claim 54:

The system of claim 53 wherein said means for enhancing and outputting result images outputs said result images at a rate of at least five images per second.

(Flock. Included, because images are produced in real time. Column 3, lines 53-55, "single integral unit also provides for the creation of a helmet capable of producing a real-time three-dimensional image of an area inside a patient in a manner that directly corresponds to the helmet wearer's line of vision.")

() Regarding Claims 55:

infrared detector (12) *is a CMOS receptor*

(Column 3, line 25-28, "image detector refers to any device capable of detecting light, including but not limited to charge-coupled device infrared cameras (CCD's)." CCD is implemented with CMOS. CMOS image sensors would be in "any device capable of detecting light".)

adapted to generate digital data (CCD) *corresponding to skin-reflected (6,8) infrared wave reception.* (infrared)

(Column 3, lines 23-27, "image detector refers to any device capable of detecting light, including but not limited to charge-coupled device infrared cameras." CCD is digital.)

() Regarding Claim 56:

The system of claim 53 further comprising a headset (Fig 5) *and at least one battery in electrical communication* (40) *with said computer unit, and wherein said display device* (14), *said computer unit* (Col8 line 14 processing), *and said at least one battery* (DC) *are attached to said headset.* (Fig 5)

(Column 3, lines 53-55, "single integral unit also provides for the creation of a helmet capable of producing a real-time three-dimensional image of an area inside a patient in a manner that directly corresponds to the helmet wearer's line of vision."
Column 3, lines 56-61 "a single integral unit comprises a helmet, at least one light source and at least one imaging detector mounted on the helmet. Additionally, the helmet may contain a monitor, such as a monitor within an eye piece, which displays the contrasted image of the anatomical structure being viewed by the helmet wearer."
Col8 line 7, "12 V DC source is mounted on a helmet")

() Regarding Claim 57:

The system of claim 53 wherein said infrared emitter (38) *and said infrared detector* (34) *are attached to said headset.* (Fig 5)

(Column 3, lines 20-25, DESCRIPTION OF THE INVENTION: "light source includes but is not limited to polychromatic sources, such as white light sources, as well as monochromatic sources such as laser light sources."
Column 3, lines 23-27, "image detector refers to any device capable of detecting light, including but not limited to charge-coupled device infrared cameras."
Column 3, lines 56-61 "a single integral unit comprises a helmet, at least one light source and at least one imaging detector mounted on the helmet.
Claim 61, "An imaging apparatus comprising a light source wherein said light source comprises a source within the infrared range;"
Column 3, lines 63-65, "helmet receive electromagnetic radiation information reflected from the patient.")

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Max Shikhman whose telephone number is (571) 270-1669; FAX (571) 270-2669. The examiner can normally be reached on Monday-Friday 8:30AM-6:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Werner can be reached on (571) 272-7401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Max Shikhman
10.3.2007

BRIAN WERNER
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